

In the Claims:

Claims 1-64. (Cancelled).

65. (New) An apparatus for use in a vertical shaft melting furnace having a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void, and further having a plurality of burners that are configured to fire into the shaft in a bottom region of the shaft, the apparatus comprising:

a device that is configured to direct a jet of hot gas into the shaft in an upper region of the shaft in a non-radial direction, whereby the non-radial jet of hot gas can induce a swirl to disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft;

wherein the device is an upper burner and the non-radial jet of hot gas comprises an upper jet of combustion products generated by the upper burner, and further comprising a plenum that communicates the upper burner with the shaft such that the upper burner is configured to fire into the plenum, and multiple upper jets of combustion products are directed from the plenum into the shaft in the upper region of the shaft, when the upper burner is fired.

66. (New) An apparatus as defined in claim 65 wherein the plenum is configured to direct the upper jets of combustion products into the upper region of the shaft in non-radial directions.

67. (New) An apparatus as defined in claim 66 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.

68. (New) An apparatus for use in a vertical shaft melting furnace having a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void, and further having a plurality of burners that are configured to fire into the shaft in a bottom

region of the shaft, with each of the plurality of burners being configured to fire with a first individual heat input, the apparatus comprising:

an upper burner that is configured to fire into the shaft in an upper region of the shaft with a second, lower individual heat input, whereby the upper burner can disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft; and

a plenum that communicates the upper burner with the shaft such that the upper burner is configured to fire an upper jet of combustion products into the plenum, and multiple upper jets of combustion products are directed from the plenum into the shaft in the upper region of the shaft, when the upper burner is fired.

69. (New) An apparatus as defined in claim 68 wherein the plenum is configured to direct the upper jets of combustion products into the shaft in the upper region of the shaft in non-radial directions.

70. (New) An apparatus as defined in claim 69 wherein the non-radial directions together extend in a common direction circumferentially around the inside of the shaft.

71. (New) A vertical shaft melting furnace comprising:

a furnace wall structure defining a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void;

a plurality of burners that are configured to fire into the shaft in a bottom region of the shaft in radial directions; and

a device that is configured to direct a jet of hot gas into the shaft in an upper region of the shaft in a non-radial direction, whereby the non-radial jet of hot gas can induce a swirl to

disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft;

72. (New) A vertical shaft melting furnace as defined in claim 71 wherein the shaft is tapered radially inward from the upper region to the bottom region.

73. (New) A vertical shaft melting furnace as defined in claim 71 wherein the plurality of burners that are configured to fire into the shaft in the bottom region of the shaft are premix burners and the device at the upper region of the shaft is a nozzle mix burner.

74. (New) A vertical shaft melting furnace comprising:

a furnace wall structure defining a shaft configured to receive metal pieces that together comprise a load that may have a vertically extending void;

a plurality of lower burners that are configured to fire into the shaft in a bottom region of the shaft in radial directions, with each of the plurality of lower burners being configured to fire with a first individual heat input;

an upper burner that is configured to fire into the shaft in an upper region of the shaft in a non-radial direction with a second, lower individual heat input, whereby the upper burner can disperse a concentrated channel of combustion products rising from the bottom region to the upper region through a void in unmelted portions of a load of metal pieces in the shaft; and

a control system that is configured to fire each of the lower burners with the first individual heat input and to fire the upper burner with the second, lower individual heat input.

75. (New) A vertical shaft melting furnace as defined in claim 74 wherein the shaft is tapered radially inward from the upper region to the bottom region.

76. (New) An apparatus as defined in claim 74 wherein the plurality of burners that are configured to fire into the bottom region of the shaft are premix burners and the upper burner is a nozzle mix burner.